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ORIGINAL RESEARCH

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# Breakfast Habits and Diet Quality in Economically Diverse African American and White Adults

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Both skipping breakfast and away-from-home (AFH) food consumption can influence diet quality. This study compared diet quality when breakfasts were eaten at home, eaten AFH, or skipped among adults (aged 32-70 years; 59% female, 62% African American) in the Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study who completed two 24-hour recalls (n = 2140). Individuals who ate breakfast at home had the highest diet quality (Healthy Eating Index-2010 score). Persons who ate breakfast AFH or skipped breakfast had diet quality scores that were 3.98 and 4.62 points lower. Dietitians could promote more at-home meals as an effective strategy to improve the diet quality for Americans' breakfast. **Key words:** *African American, away-from-home foods, breakfast, diet quality*

**A**LTHOUGH the importance of breakfast is well known, approximately 20% of Americans report skipping breakfast on national dietary recalls.<sup>1-3</sup> African American<sup>4,5</sup>

and low-income populations<sup>5</sup> have been more likely to skip breakfast than other groups. The prevalence of breakfast skipping was so high that the 2010 Dietary Guidelines for Americans included "eating a nutritious breakfast" as a goal.<sup>6</sup>

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Breakfast skippers often have lower-quality diets; overall, their diets have more added sugars,<sup>1,2,7</sup> fewer "shortfall" micronutrients,<sup>2</sup> and fewer servings of fruit and whole grains.<sup>5</sup> Breakfast skippers were less likely to meet the Recommended Dietary Allowances for nutrients.<sup>8</sup> The low nutrient intake is independent of the total number of eating occasions, meaning that the lack of nutrients cannot be made up for by eating snacks.<sup>9</sup>

Prevalence of consuming breakfast away from home (AFH) varies by study population, with a range from 8% to 25%.<sup>8,10</sup> AFH foods can be described as foods that are

eaten or obtained away from the home.<sup>11</sup> AFH foods have been associated with low diet quality<sup>10,12</sup> and increased intakes of fat, energy, and sodium.<sup>11,13,14</sup> AFH foods obtained from fast food restaurants, in particular, increased sugar intake and decreased fiber intake.<sup>13</sup> Although less common than other meals, AFH breakfasts have larger negative effects on diet quality than other AFH eating occasions.<sup>10</sup> An AFH breakfast was estimated to decrease the Healthy Eating Index (HEI) score by 4.5 points.<sup>10</sup>

Although both skipping breakfast and AFH breakfasts have been associated with decreased diet quality, the decreases have not been compared. The purpose of this study was to characterize the breakfast habits of a racially and socioeconomically diverse, urban population and to compare diet quality when breakfasts are eaten at home, eaten AFH, or skipped.

## METHODS

### Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study

The HANDLS study is a prospective study of African American and white adults residing in Baltimore, Maryland. The HANDLS study was designed to examine the influence of race and income on selected health outcomes in an aging cohort and has been described elsewhere in detail.<sup>15</sup> The study sample includes participants from 13 neighborhoods using a factorial/crossed design of age, sex (male, female), race (African American, white), and income (self-reported household income <125% and ≥125% of the 2004 US Department of Health and Human Services poverty guidelines).

During data collection in wave 3 between June 2009 and July 2013, participants came to a Mobile Research Vehicle (MRV) for assessment. Several measures of health were collected, including a 24-hour dietary recall, medical history, physical examination, and cognitive tests. Literacy was measured using the Wide Range Achievement Test (WRAT-

3).<sup>16</sup> Between 4 and 10 days after their MRV visit, participants reported another 24-hour dietary recall over the phone.<sup>17</sup> The study protocol was approved by the National Institute of Environmental Health Sciences, National Institutes of Health institutional review board (IRB) and the IRB at the University of Delaware. All HANDLS participants provided a written informed consent and were compensated monetarily.

### Dietary procedure

The US Department of Agriculture's (USDA) Automated Multiple-Pass Method (AMPM) was used to complete 24-hour dietary recalls.<sup>18</sup> Trained interviewers used this computer-assisted interview technique following 5 steps (quick lists, forgotten food, time and occasion, detailed description, and final probe). Interviewers collected all information on the foods and beverages consumed by participants within the previous 24-hour day, from midnight to midnight. Food models and booklets were used by participants to estimate portion sizes. During the recall, participants were asked to name each eating occasion (ie, breakfast, lunch, dinner, brunch, supper, snack, drink, or extended consumption) and where it was eaten (home or away).<sup>18</sup> A meal's location was based on where the first bite was eaten. From a selection of 26 options, participants were also asked to list where each food was obtained (eg, from the grocery store, from a fast food restaurant, from a vending machine). For the analysis, the location where meals were eaten was applied to define meals as "away from home" or not, and the participant's naming of the meal was used to define breakfast.

After the interviews were collected, trained coders used SurveyNet to match foods to their codes from the Food and Nutrient Database for Dietary Studies (FNDDS, version 5.0).<sup>19</sup> From these codes, energy, macronutrients, and micronutrient intakes were calculated.

### Diet quality measure

The HEI-2010 was used to assess diet quality. The HEI-2010 is a valid and reliable

measure of diet quality and compares intakes with federal diet standards, namely, the Dietary Guidelines for Americans.<sup>20</sup> Foods are divided into 12 components (9 adequacy and 3 moderation components). For the adequacy components, a higher score is given for a higher intake; however, in components where moderation is key (such as sodium), a higher score is given for a lower intake. Components vary in their maximum scores from a possible 5 to 20 points; for all components, energy is accounted for by calculating intake per 1000 kcal. The scores from each category are added up to give a total HEI score, which ranges from 0 to 100 (100 being the highest-quality diet). HEI scores were calculated from the 24-hour recall data for both days and then averaged. For more information on HEI score calculations, see the HANDLS Web site (<http://handls.nih.gov/06Coll-w01HEI.htm>).

### Statistical analysis

Analysis included only the participants who completed both 24-hour dietary recalls in wave 3 ( $n = 2140$ ). Subjects who ate breakfasts in more than 1 location on a single recall, or who listed an unknown location for breakfast consumption, were excluded. After categorizing subjects by breakfast habits (home breakfast consumers, AFH breakfast consumers, or breakfast skippers), those who switched breakfast habits across recall days (13.3%) were excluded, leaving an analytical sample of 1834. Those excluded were not different in age, race, or sex; however, a small percentage of low-income participants were excluded, defined as below 125% of the 2004 US federal poverty guidelines (Figure).

Descriptive statistics were calculated for demographic and dietary data for the 3 groups. Independent-samples *t* tests were used to compare breakfast nutrients between home breakfast consumers and AFH breakfast consumers. Chi-square and one-way analysis of variance tests with Tukey HSD post hoc analysis were used to compare demographics and HEI component scores among the 3 breakfast groups.

Regression models were used to compare the 3 breakfast groups with HEI total scores. Age, sex, race, poverty status, a race by poverty status interaction, body mass index (BMI), marital status, employment, education, smoking, C-reactive protein (a measure of inflammation), and literacy were considered as potential covariates. Any variable that was not significant in the model was removed, with the exception of race, poverty status, and their interaction; these variables were retained because of the overall HANDLS study aims. All model assumptions, including normality and linearity, were evaluated. A *P* value of .05 or less was considered significant.

## FINDINGS

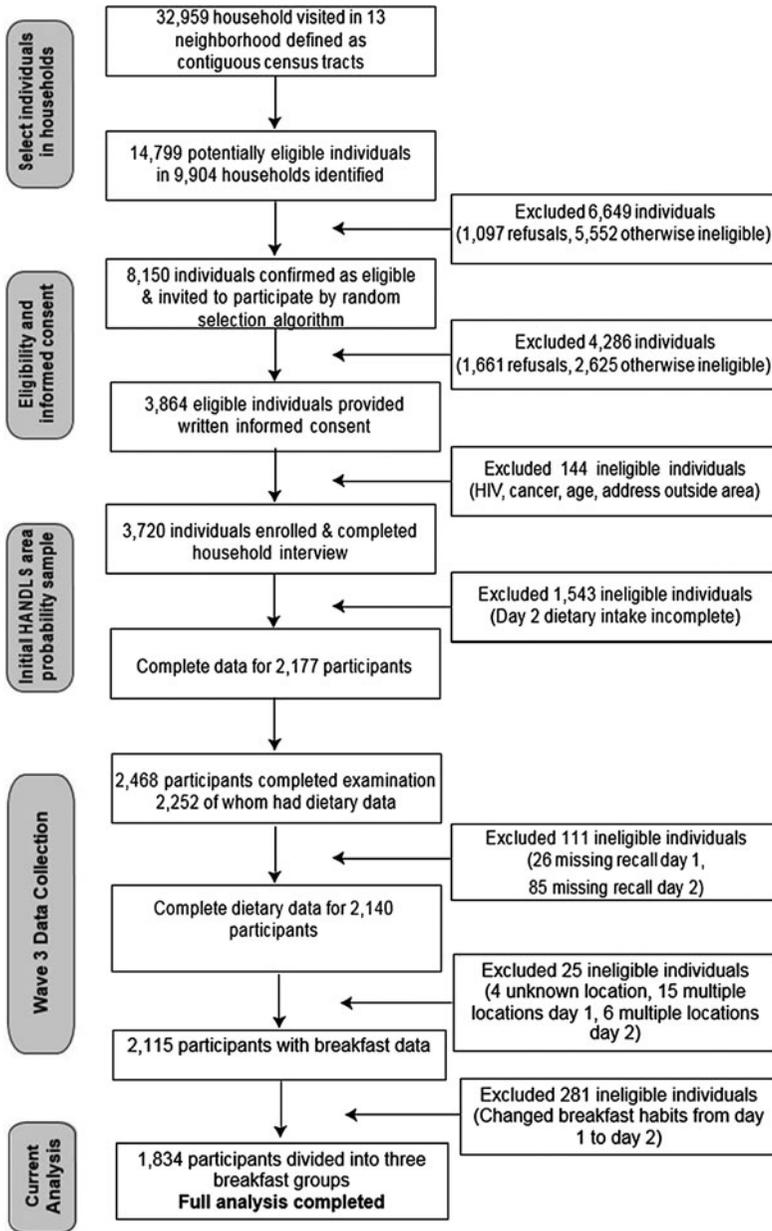
### Sample population

The HANDLS participants ( $n = 1834$ ) in this study were female ( $n = 1082$ ; 59.0%), white ( $n = 705$ ; 38.4%), and low-income ( $n = 770$ ; 42.0%). The mean  $\pm$  SE age was  $53.2 \pm 0.2$  years and the mean  $\pm$  SE BMI was  $30.8 \pm 0.1$  kg/m<sup>2</sup>.

### Breakfast habits

All subjects who consumed breakfast on day 1 also consumed breakfast on day 2. Overall, 60.8% were breakfast consumers and 39.2% were breakfast skippers. When comparing breakfast skippers with breakfast consumers (either home or away), breakfast consumers were older with higher literacy and a higher percentage were nonsmokers (data not shown).

Categorization into 3 breakfast groups (skippers, home consumers, or AFH consumers) revealed that 47.5% ( $n = 872$ ) of participants ate breakfast at home on both days and 7.2% ( $n = 133$ ) of participants ate both breakfasts AFH. Home breakfast consumers were significantly older than the other groups. AFH breakfast consumers had significantly higher average BMI, higher literacy scores, higher rates of employment, and lower rates of smoking than the other 2 groups. A



**Figure.** Healthy Aging in Neighborhoods of Diversity across the Life Span study participant flowchart.

higher percentage of breakfast skippers were low-income and smokers (Table 1).

In general, foods eaten at home were beverages with additions (21.9%; eg, coffee with cream and sugar), cereal with additions (16.1%; eg, cereal with milk), sandwiches (11.9%; eg, egg sandwiches), and bread/baked

product with additions (11.4%; eg, toast with butter). Breakfast foods eaten at home were mainly obtained from grocery stores (93.9%). Only a small proportion of breakfasts were obtained from fast food restaurants (1.5%).

For foods eaten AFH, beverages with additions were common (22.5%), as were

**Table 1.** Comparison of Demographics for HANDLS Study Participants by Breakfast Group<sup>a</sup>

	Home Breakfast Consumers (n = 872)	AFH Breakfast Consumers (n = 133)	Post hoc <sup>b</sup> P, Home vs AFH	Breakfast Skippers (n = 839)	Post hoc <sup>b</sup> P, Home vs Skip	Post hoc <sup>b</sup> P, AFH vs Skip
Sex (% male) <sup>c</sup>	40.7	39.1	.934	41.6	.924	.848
Race (% white) <sup>c</sup>	39.6	36.8	.820	37.5	.661	.988
Income (% below poverty) <sup>d</sup>	42.4	26.3	<b>.001</b>	44.0	.781	<b>.001</b>
Marital status (% married) <sup>c</sup>	31.8	38.1	.382	30.2	.839	.236
Employed, %	36.3	87.5	<b>.001</b>	47.1	<b>.001</b>	<b>.001</b>
Smoking, %	42.3	33.9	.210	53.9	<b>.001</b>	<b>.001</b>
Education, %			.368		<b>.001</b>	<b>.001</b>
Less than high school	7.1	4.8		7.5		
Some high school, no degree	56.4	48.8		65.6		
Graduated high school	19.3	31.2		18.3		
Higher degree	17.1	15.2		8.6		
	$\bar{X} \pm \text{SEM}$	$\bar{X} \pm \text{SEM}$		$\bar{X} \pm \text{SEM}$		
Age, y	54.7 ± 0.3	51.2 ± 0.8	<b>.001</b>	52.0 ± 0.3	<b>.001</b>	.556
BMI, kg/m <sup>2</sup>	30.3 ± 0.3	33.0 ± 0.8	<b>.001</b>	30.9 ± 0.3	.181	<b>.016</b>
Literacy (WRAT-3 score)	42.4 ± 0.3	44.2 ± 0.6	.049	41.6 ± 0.3	.147	<b>.003</b>
C-reactive protein, mg/L <sup>c</sup>	7.2 ± 0.4	6.5 ± 0.8	.854	8.0 ± 0.5	.413	.453
Energy, whole-day intake, kcal	2073 ± 29	2314 ± 77	<b>.006</b>	1875 ± 29	<b>.001</b>	<b>.001</b>
Energy, breakfast, kcal	120 ± 2	154 ± 9	<b>.001</b>	...	...	...

Abbreviations: AFH, away from home; ANOVA, analysis of variance; HANDLS, Healthy Aging in Neighborhoods of Diversity across the Life Span; SEM, standard error of mean; WRAT-3, Wide Range Achievement Test.

<sup>a</sup>Bolded values indicate significant *P* value.

<sup>b</sup>Post hoc Tukey test results after ANOVA test.

<sup>c</sup>ANOVA was not significant, *P* ≥ .05.

<sup>d</sup>Defined as 125% or less of the 2004 federal poverty level.

bread/baked products with additions (9.8%). However, cereal with additions decreased to 4.1% and sandwiches increased to 20.7%. AFH foods were obtained from grocery stores (43.1%), fast food restaurants (27.6%), and full service restaurants (9.7%).

Breakfasts eaten at home contained significantly less energy than those eaten AFH (Table 1). Per 100 kcal, home breakfasts had

0.4 g more protein (*P* = .002), 0.1 g more fiber (*P* = .001), and 0.3 g less total fat (*P* = .020) than AFH breakfasts. Both home and AFH breakfasts contained minimal amounts of fiber and omega-3 fatty acids (data not shown).

### Diet quality and breakfast habits

Unadjusted results for the HEI total and component scores are shown in Table 2. The

**Table 2.** Comparison of HEI-2010 Total and Component Scores of HANDLS Study Participants by Breakfast Group<sup>a</sup>

HEI-2010 Components (Maximum Score)	Home Breakfast Consumers (n = 872) $\bar{X} \pm SEM$	AFH Breakfast Consumers (n = 133) $\bar{X} \pm SEM$	Post hoc <sup>b</sup> P, Home vs AFH	Breakfast Skippers (n = 829) $\bar{X} \pm SEM$	Post hoc <sup>b</sup> P, Home vs Skip	Post hoc <sup>b</sup> P, AFH vs Skip
<b>Adequacy</b>						
Total vegetables (5)	2.8 ± 0.1	2.6 ± 0.1	.279	2.6 ± 0.1	<b>.004</b>	.990
Greens and beans (5)	1.5 ± 0.1	1.0 ± 0.1	<b>.004</b>	1.1 ± 0.1	<b>.001</b>	.981
Total fruit (5)	2.1 ± 0.1	1.9 ± 0.2	.732	1.4 ± 0.1	<b>.001</b>	<b>.001</b>
Whole fruit (5)	1.8 ± 0.1	1.7 ± 0.2	.891	1.1 ± 0.1	<b>.001</b>	<b>.001</b>
Whole grains (10)	2.8 ± 0.1	1.8 ± 0.2	<b>.001</b>	1.5 ± 0.1	<b>.001</b>	.336
Total dairy (10)	4.6 ± 0.1	3.8 ± 0.2	<b>.002</b>	3.6 ± 0.1	<b>.001</b>	.787
Total protein foods (5)	4.4 ± 0.03	4.4 ± 0.1	.932	4.2 ± 0.04	<b>.001</b>	<b>.011</b>
Seafood and plant proteins (5)	1.9 ± 0.1	2.2 ± 0.2	<b>.042</b>	1.6 ± 0.1	<b>.007</b>	<b>.001</b>
Fatty acids <sup>c</sup> (10)	5.2 ± 0.1	5.6 ± 0.2	.389	5.3 ± 0.1	.774	.607
<b>Moderation</b>						
Sodium (10)	3.9 ± 0.1	4.1 ± 0.2	.735	4.5 ± 0.1	<b>.001</b>	.202
Refined grains (10)	6.7 ± 0.1	5.6 ± 0.2	<b>.001</b>	6.8 ± 0.1	.839	<b>.001</b>
Empty calories (20)	11.2 ± 0.2	10.9 ± 0.4	.733	9.3 ± 0.2	<b>.001</b>	<b>.004</b>
Total score (100)	49.0 ± 0.4	45.8 ± 0.9	<b>.011</b>	43.0 ± 0.4	<b>.001</b>	<b>.028</b>

Abbreviations: AFH, away from home; ANOVA, analysis of variance; HANDLS, Healthy Aging in Neighborhoods of Diversity across the Life Span; HEI, Healthy Eating Index; SEM, standard error of mean.

<sup>a</sup>Bolded values indicate significant P value.

<sup>b</sup>Post hoc Tukey test results after ANOVA test.

<sup>c</sup>ANOVA was not significant, P ≥ .05.

overall mean ± SE HEI score for the analytical sample was 46.0 ± 0.3. The total HEI scores were significantly different across breakfast groups. Home breakfast consumers had the highest mean ± SE HEI score of 49.0 ± 0.4 and breakfast skippers had the lowest score of 43.0 ± 0.4.

Home breakfast consumers had significantly higher greens and beans, whole grain, whole dairy, and refined grains scores and a lower seafood and plant protein score than AFH breakfast consumers over the whole day. Home breakfast consumers also had significantly higher scores for all components except fatty acids and refined grains when compared with breakfast skippers. AFH breakfast consumers had higher total fruit, whole fruit, seafood and plant proteins, fatty acid, and

empty calorie scores than those who skipped breakfast. However, they had a significantly lower refined grains score (Table 2).

After adjusting for covariates, eating breakfast at home was associated with higher HEI scores than eating breakfast AFH or skipping breakfast (Table 3). Eating breakfast AFH was associated with a 3.98-point decrease in HEI score, and skipping breakfast was associated with a 4.62-point decrease in HEI score. In addition, being older, being female, having higher literacy, and having lower BMI were associated with increased HEI scores. The largest increases in HEI score were related to having a degree beyond a high school diploma (associated with an 8.64-point increase) and being a nonsmoker (associated with a 5.96-point increase).

**Table 3.** Factors Influencing the HANDLS Study Participants' Healthy Eating Index-2010 Scores by Multiple Regression

Factor	Estimate	Standard Error	<i>P</i> <sup>a</sup>
Intercept	45.869	4.746	<b>.001</b>
Age, y	0.169	0.034	<b>.001</b>
Sex (Ref: female)	-1.952	0.628	<b>.002</b>
Race (Ref: white)	1.632	1.903	.391
Income (Ref: above poverty) <sup>b</sup>	-1.929	2.178	.376
Race × Poverty status	0.078	1.287	.951
BMI, kg/m <sup>2</sup>	-0.111	0.040	<b>.006</b>
Smoking (Ref: nonsmoker)	-5.963	0.669	<b>.001</b>
Literacy (WRAT-3 score)	0.130	0.045	<b>.004</b>
Breakfast Group (Ref: home breakfast consumer)			
AFH breakfast consumer	-3.978	1.195	<b>.001</b>
Breakfast skipper	-4.622	0.645	<b>.001</b>
Education (Ref: less than high school)			
Some high school, no degree	2.381	1.274	.062
Graduated high school	2.806	1.452	.053
Higher degree	8.639	1.571	<b>.001</b>

Abbreviations: AFH, away from home; BMI, body mass index; HANDLS, Healthy Aging in Neighborhoods of Diversity across the Life Span; WRAT-3, Wide Range Achievement Test.

<sup>a</sup>Bolded values indicate significant *P* value.

<sup>b</sup>Defined as 125% or more of the 2004 federal poverty level.

## DISCUSSION

To our knowledge, this analysis is the first to explore the relationship between breakfast habits (consumed at home, consumed AFH, or skipped) and HEI-2010 in a diverse urban population. Participants who ate breakfast at home had higher mean diet quality scores than those who ate breakfast AFH. However, those who ate breakfast AFH still had higher diet quality scores than those who skipped breakfast.

In this analysis, an AFH breakfast was related to a 3.98-point decrease in HEI score. This difference was slightly smaller than that shown by Mancino et al<sup>10</sup> (a decrease of 4.5 points for AFH breakfast). That study used national US intake data from 1994-1996 and 2003-2004, so it is possible that AFH breakfasts have improved in diet quality over the past decade. However, that study used the HEI-2005, which differs slightly from the 2010 version for calculating diet quality. In addition,

the Mancino et al study did not compare AFH breakfasts with skipped breakfasts.

The association between breakfast habits and changes in diet quality may be related to the types of breakfast foods available in different locations. For example, in a study by O'Neil et al,<sup>1</sup> a breakfast of presweetened ready-to-eat cereal with lower-fat milk was shown to increase diet quality compared with skipping breakfast; in this analysis, cereal was more likely to be consumed at home than AFH. Other breakfast choices that do not improve diet quality may be more available AFH. The association could also be related to the presence of eating with others; eating alone has been linked to poor nutritional outcomes in adults.<sup>21</sup> Perhaps, participants of the HANDLS study ate breakfast with family members when at home, contributing to improved diet quality. Data for whether meals were eaten alone, with family members, or communally were not collected in this study but may be an intriguing question for future research.

The association between breakfast habits and diet quality may also be due to health behavior patterns. As in previous studies, breakfast skipping in this analysis was clustered with smoking, lower levels of education, and being male. Stress may also cause differences in diet quality between the breakfast groups; for breakfast skippers but not breakfast consumers, stress has been associated with empty calories and intake of added sugars in the evening.<sup>7</sup> Perceived stress was not measured in wave 3 of this study, so this relationship could not be explored.<sup>15</sup> Further research on health behavior including stress may help explain the association between breakfast habits and diet quality.

The findings suggest that meal location should be considered in counseling and in nutrition policy. In counseling clients wishing to increase their diet quality, they could be encouraged to eat breakfast at home. More frequent home-cooked meals and less frequent AFH consumption have also been shown to decrease food expenditures while increasing diet quality,<sup>12</sup> an important factor in low-income communities. Eating breakfast AFH may provide for higher diet quality than skipping breakfast altogether. Therefore, consumption of breakfast should be encouraged and perhaps more education on healthier menu selections is warranted for AFH.

AFH foods are common among US adults, with increased AFH expenditures among nonwhites and those with lower income.<sup>22</sup> In 2007-2008, 36% and 27% of adults reported consumption of fast food and full-service restaurant food on their National Health and Nutrition Examination Survey (NHANES) recall, respectively.<sup>23</sup> Another study estimated that 3.9 AFH meals were consumed per week.<sup>24</sup> Analysis of HEI scores for 5 common fast food restaurants suggests that improvements are needed in AFH menus.<sup>25</sup> Perhaps, clients should be counseled to choose healthier AFH items, while AFH chains should be encouraged to improve the healthfulness of their selections.

The breakfast patterns of the HANDLS sample provided new information about diets

of socioeconomically and racially diverse urban groups.<sup>15</sup> Nearly 40% of participants skipped breakfast on both days of recall, which was higher than previous studies that reported approximately 20% of NHANES subjects skipping breakfast.<sup>1-3</sup> This finding was expected considering that the demographics of the HANDLS study population (a high percentage of African Americans and low-income individuals) more closely match previous profiles of breakfast skippers than the general NHANES sample. In the HANDLS sample, about 12% of participants ate breakfast AFH on one of their recalls. This percentage is much lower than that reported in the Nicklas et al<sup>8</sup> study (25%). Nicklas et al<sup>8</sup> used a sample of young adults (19-28 years old) who may have different breakfast habits from those of the HANDLS sample (32-70 years old).

The mean HEI-2010 score of the HANDLS study population was close to 13 points lower than the NHANES 2011-2012 average for the US population (score of 59).<sup>26</sup> As noted by Kuczmarski et al,<sup>27</sup> education has a strong influence on diet quality in this population. In this analysis, those who obtained a degree past high school had better diet quality than those with less than a high school education. Low-income, nonwhite populations are reported to have lower diet quality than those of higher-income or white background.<sup>28</sup> Considering our results, one way to improve diet quality may be to encourage people to eat breakfast at home or, if limited by time, to select healthful foods when eating breakfast AFH rather than skipping this meal.

Strengths of this study include the use of a racially and socioeconomically diverse, urban sample, often underrepresented in research studies. Also, the use of two 24-hour recalls is a strength, as the HEI-2010 scores were based on an average. Only participants who had the same breakfast habits on both days of the dietary recalls were included, increasing the strength of the analysis.

Limitations include the possibility of underreporting due to participant-based recall

in this study; however, the USDA's AMPM has been shown to reduce bias in energy collection.<sup>29</sup> Also, because this analysis was cross-sectional, no conclusions can be drawn about causation. Because of the changing nature of breakfast consumption over the 10-year difference between HANDLS baseline and wave 3, as well as the small sample size in the AFH group, it was deemed inappropriate to use a longitudinal design for this data collection. Future research with additional HANDLS study waves, yielding larger sample sizes and more frequent measurements of breakfast habits, could affect this limitation.

## CONCLUSION

To our knowledge, this is the first study to consider breakfast habits and their relation to diet quality in a diverse sample of adults. Breakfasts eaten at home were associated with higher diet quality than breakfasts eaten AFH. Nutrition professionals could apply this knowledge by encouraging clients to eat breakfast at home. Future research that uses longitudinal data, explores different definitions of "away from home" foods, and examines the relationship between breakfast and diet quality in a different population may extend these findings.

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